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# CyPhone Mediaphone Project – Taxi Trip Scenario

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**Abstract**

This presentation has been created for design purposes within the CyPhone project. It describes the project in general, one of the Mediaphone concepts developed in the project, and a storyboard of the use of different services experimented with in the project.

**Key words**: ICAT '99, Virtual Reality, Camera Ready, Mediaphone, HCI, scenario, mobile services

## Introduction

The Cyphone2 research project aims at constructing a research environment to experiment with a augmented reality user interface concepts for future media phones.

Recent advances in mobile communication based on picocellular technologies allow the transmission of high bandwith of data over personal surrounding networks. We analyze in our research the sources of real-time constraints in tele-presence and augmented reality applications. We offer an approach to adding aspects of mobility and augmented reality to real-time mobile telepresence, discuss the technology and depict a potential future product concept called the CyPhone. The CyPhone is a small sized combination of a digital stereo camera, a notepad computer and a cellular phone.

## Wireless picocellular network as a backbone

The core idea of our approach is to use short distance radio communication network and create "ubiquitous computing" where different devices around us are computationally active and can recognize our presence and identity. But instead of a multitude of different displays and interaction devices we suggest that the interaction with all the devices would take place in an "augmented reality", for example by using a head-mounted see-through display and a mobile phone/remote controller.

The backbone of the mobile virtual reality is a wireless picocellular network, such as Bluetooth. The benefits of using very small cells in mobile virtual reality are obvious. The smaller the cell size, the higher the output,

because there are fewer users in each cell and higher transmission frequencies can be used. Very high frequencies are usually not used in mobile networks because of quick signal attenuation, but if the transmission range is just a few meters, the effect of attenuation is almost negligible. The diameter of a personal cell in our system is some three to ten meters, which enables the construction of small, very low-powered hand held terminals still capable of transmitting high bandwidth multimedia data required by the virtual reality applications.

From the research point of view it is very interesting to find out what kind of communication load patterns and real-time response behaviors do different augmented reality services create. We can distinguish different sources of real-time constraints in telepresence and augmented reality applications. These include peer-to-peer object detection time, which determines how quickly the receiver can gain telepresence in the desired view or place. Recent studies propose the use of real-time view-dependent image generation from omni-directional video camera streams.

Public network access and transmission delay determines the setup and reset delays for telepresence connections. A recent study proposes the use of rate-based transport protocols. Otherwise the receiver would have to maintain a long packet reorganisation queue in order to provide fixed sample rate characteristics. Annotation fetch cycle determines how quickly the terminal can access virtual world-model servers containing the intelligence for generating the annotations. Annotations are generated based on the information requested, on the intelligent objects referenced, on the place of the observer, and on what kind of service the customer has subscribed to. The annotation synchronization cycle determines how quickly the augmented reality annotations can follow directional changes, i.e. how well they keep up with the real world. Local tracking determines how quickly and accurately the user's movements are recognized by the tracking system. It is a function of the tracking accuracy, sampling rate and filtering, as well as of the distances reached and the real-time speeds of the user and the objects. We expect to reach a better understanding of load and response time characteristics and their relation to perceived quality of service through our research experiments.

The result are valueble for industry in estimating the cost of building and operating augmented reality services, networks and terminals.

The intensifying competition requires specialization and development of new product concepts by the Finnish telecom industry and operators. In the field of mobile communications systems the value can be added by offering the clients customized equipment and new services.

## Novel behavior and communication patterns

The CyPhone concept framework can serve as a forerunner product platform for several potential value-added services. These services can be divided into the following categories:

- annotation services (guidance, electronic commerce)
- telepresence services (tourism, teletaching, nursery)
- monitoring and maintenance (real-estate and roperty maintenance and alarm systems)
- home services (child and senior citizen day-care)
- entertainment services (group games, athletics, training)
- personal services (pets, tamagotchis, virtual family, virtual friends, cyberdating)

One of the most outstanding novel service concepts is personal navigation and guidance. A congress guest in a foreign town can send an enquiry to a service provider that can show the client the right location or route. Augmented reality can be applied by adding direction arrows and other signs or text messages the client's view through data glasses or ordinary eyeglasses. Nobody else can detect that a person is foreigner and thus helps the person to feel safe and secure and boosts confidence. We believe that navigation services will become invaluable for most of us in next five to ten years.

Another novel service concept is mobile telepresence. It can be exploited in meetings and new ways of working, in guarding, control and security services. In the future telepresence can also help elderly people living in their own apartments by improving security. Telepresence can also be used in virtual tourism. A visitor can recognise and capture the works of art in one of the world's famous museums and transmit his or her experiences back home in real-time via the Internet, and share the experience. Information gets often better when you can share it with someone you care for.

Electronic commerce and entertainment applications have a great potential to take advantage of augmented reality. Basically the mechanism is that we are able to attach product data and links to physical real-world objects, which may be used to help potential customers to reach contact with product supplier.

Our research is progressing through incremental prototyping approaching starting from concept models, their visualisations, virtual reality prototypes, and hardware prototypes. Currently we have reached three generations of concept models and two generations of hardware prototypes. The main design goals for CyPhone prototype have been scalability for different augmented reality applications, small size, power consumption suitable for mobility, and a modular

architecture that enables easy upgrading of modules for processor, frame buffer, network adapter, sound and position tracking. The modules are packed into lightweight aluminum cases and mounted to a belt for wearability. We are using Sony Glasstron see-through head-mounted-display viewing with a resolution of 800x600 pixels in 24 bit true colour. The prototype software is built on top of Symbian Epoc32/Java/WAP platform and Linux/Apache/mySQL on the server side. The user interface metaphor is based on a novel Quality Function Deployment inspired graphical matrix layout scheme which is being developed in Academy of Finland funded Telectronics programme Paula project.

The research is carried out at the Infotech Oulu Research Institute at University of Oulu, and at government research institute VTT Electronics.

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* You need to have VRML plug-in in order to browse the page.